

Multi-Emissions Strategies at Electric Power Plants

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Numerous Multi-Emission Proposals

- Jeffords
- McCain / Lieberman
- Carper
- Clear Skies
- Some just cover the power sector, while others are broader.
- Some focus on 3-P (SO₂, NO_x, Hg) while others include carbon.



Two EIA Multi-Emission Report

- Reducing Emissions of Sulfur Dioxide, Nitrogen Oxides, and Mercury from Electric Power Plants, September 2001, prepared at the request of Senators Smith, Voinovich, and Brownback
- Analysis of Strategies for Reducing Multiple Emissions from Electric Power Plants with Advanced Technology Scenarios, October 2001, prepared at the request of Senators Jeffords and Lieberman

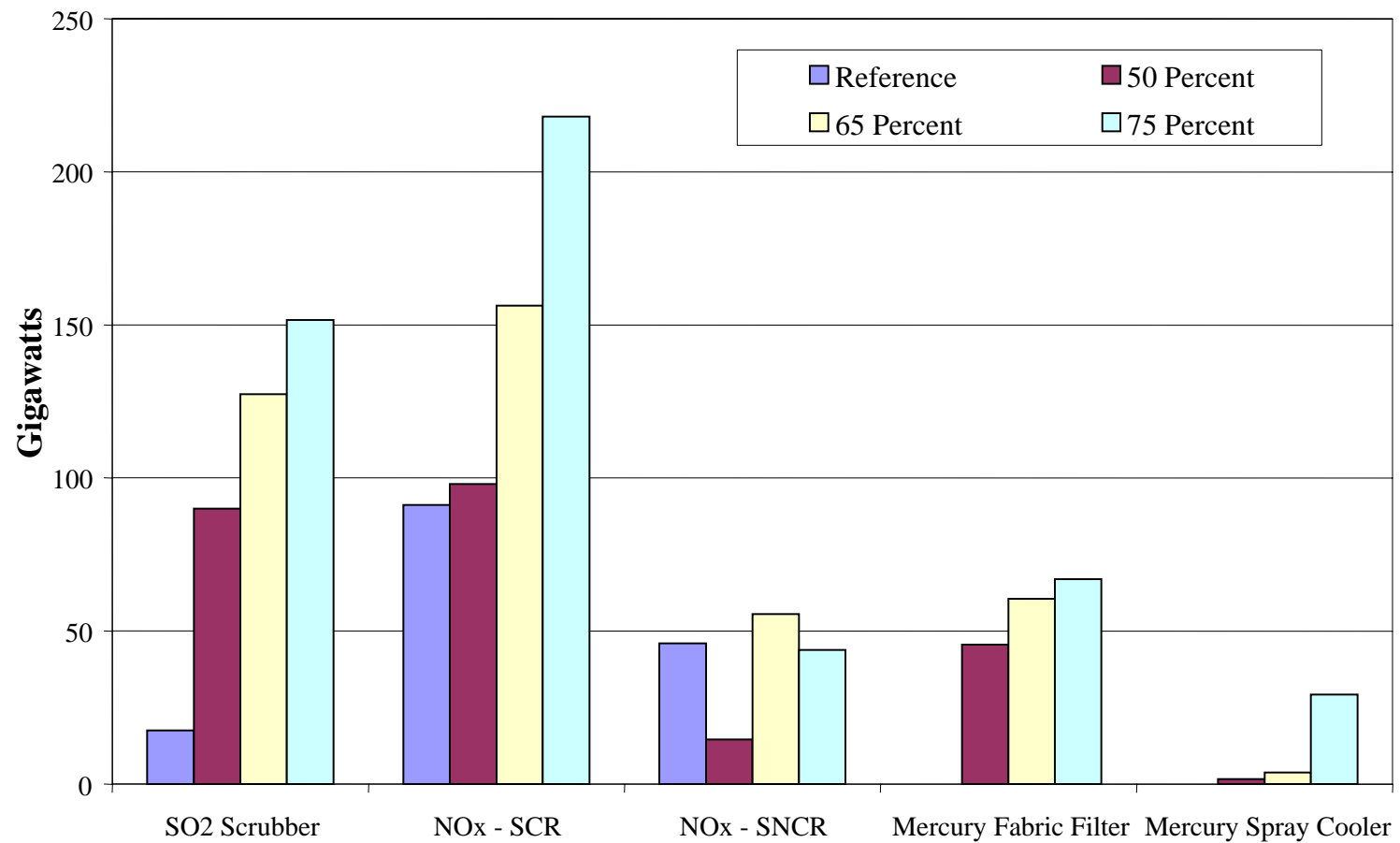
The Smith/Voinovich/Brownback Report

- Three emission scenarios
- Each emission targeted at 50, 65, and 75 percent below base, respectively
- NO_x and Hg bases are 1997 levels
- SO₂ base is Phase II target of the Clean Air Act Amendments of 1990

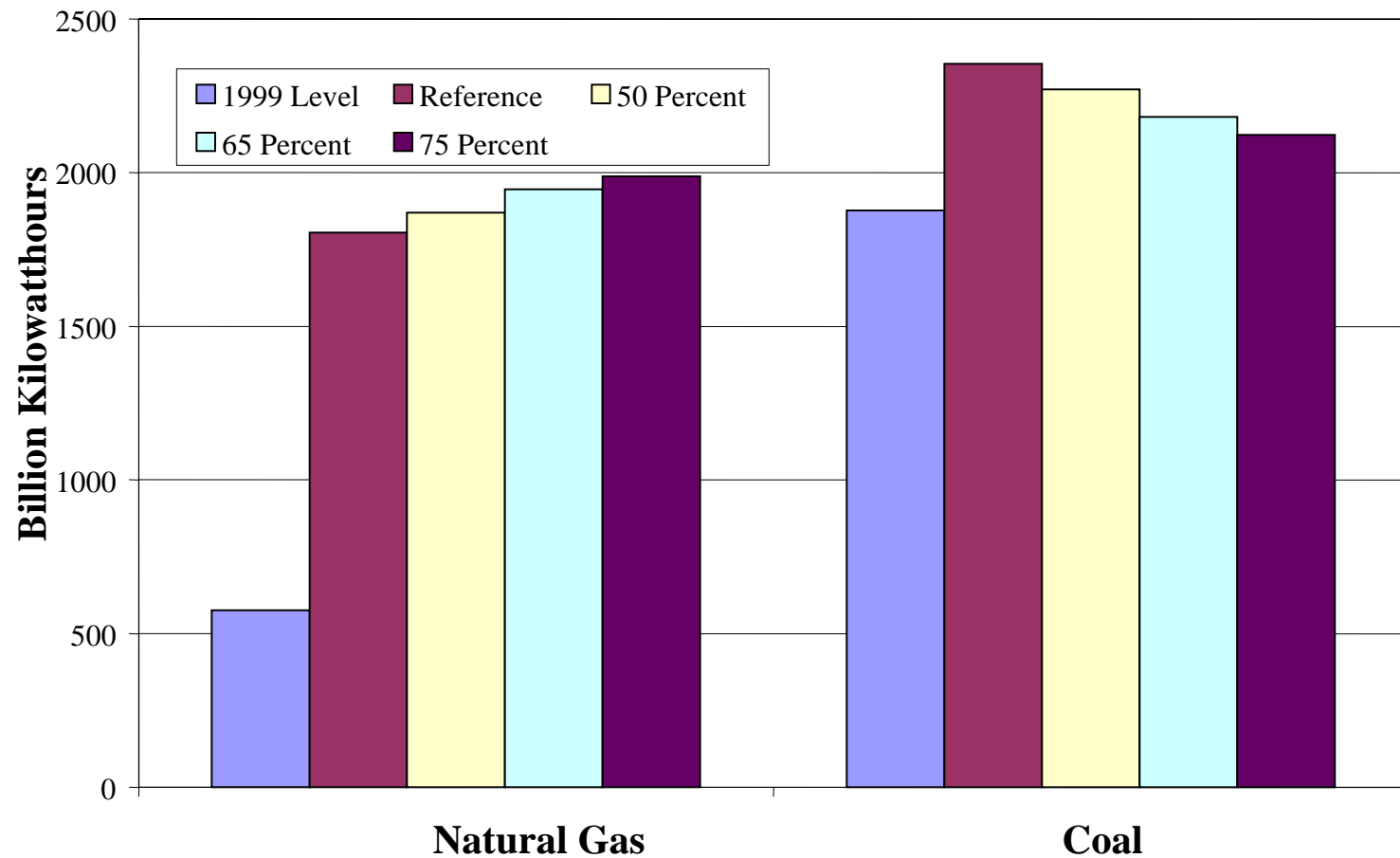
The Smith/Voinovich/Brownback Report (contd.)

- Emission reduction programs begin in 2002 with half of reductions occurring by 2007 and full compliance by 2012
- Programs are assumed to cover all generators except industrial cogenerators
- Half of required mercury reductions come from plant specific actions rather than through trading
- Programs are patterned after the SO₂ system created in the Clean Air Act Amendments in 1990

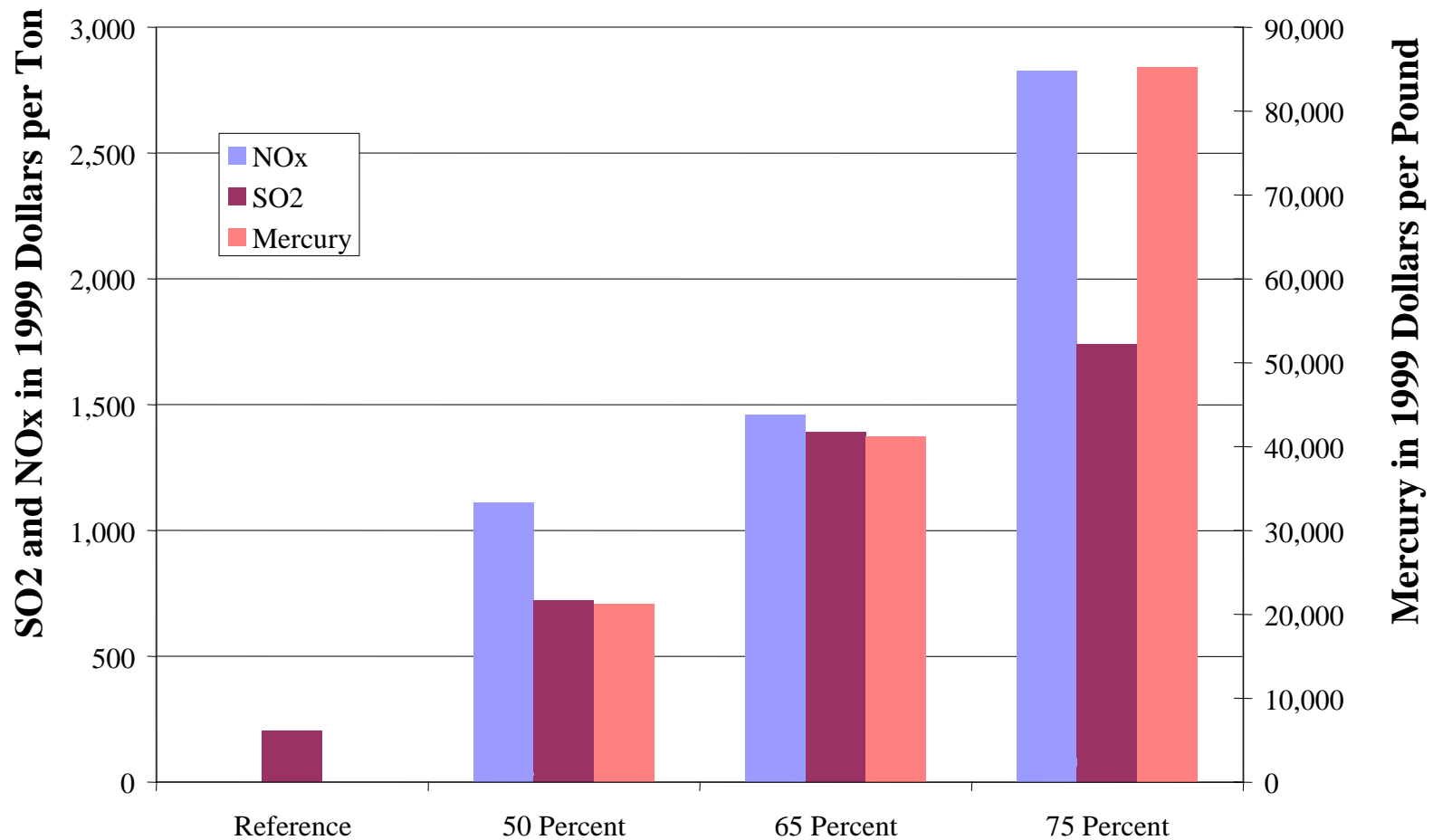
Capacity Adding Emissions Control Equipment Through 2020



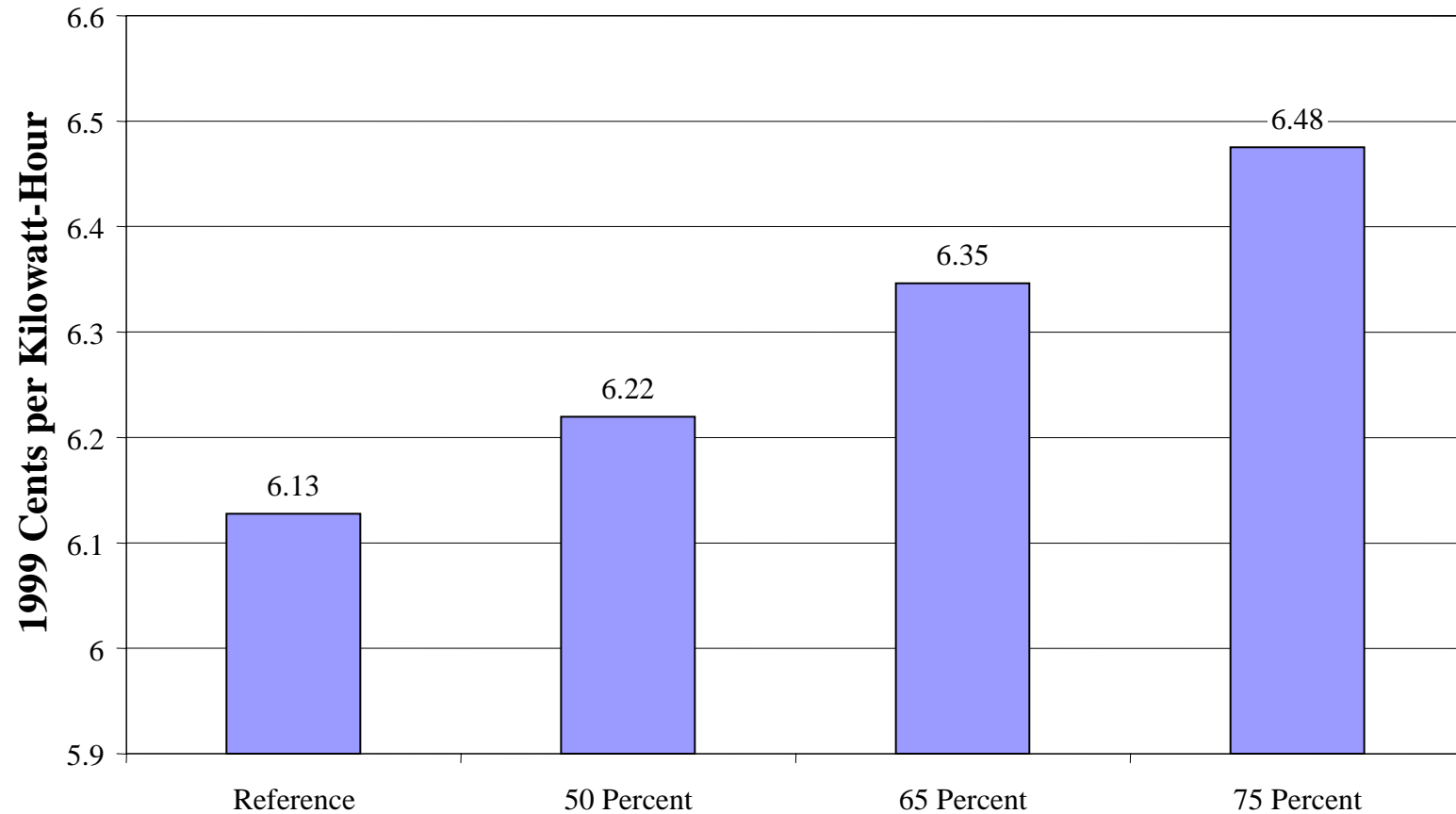
1999 and 2020 Coal and Natural Gas Generation



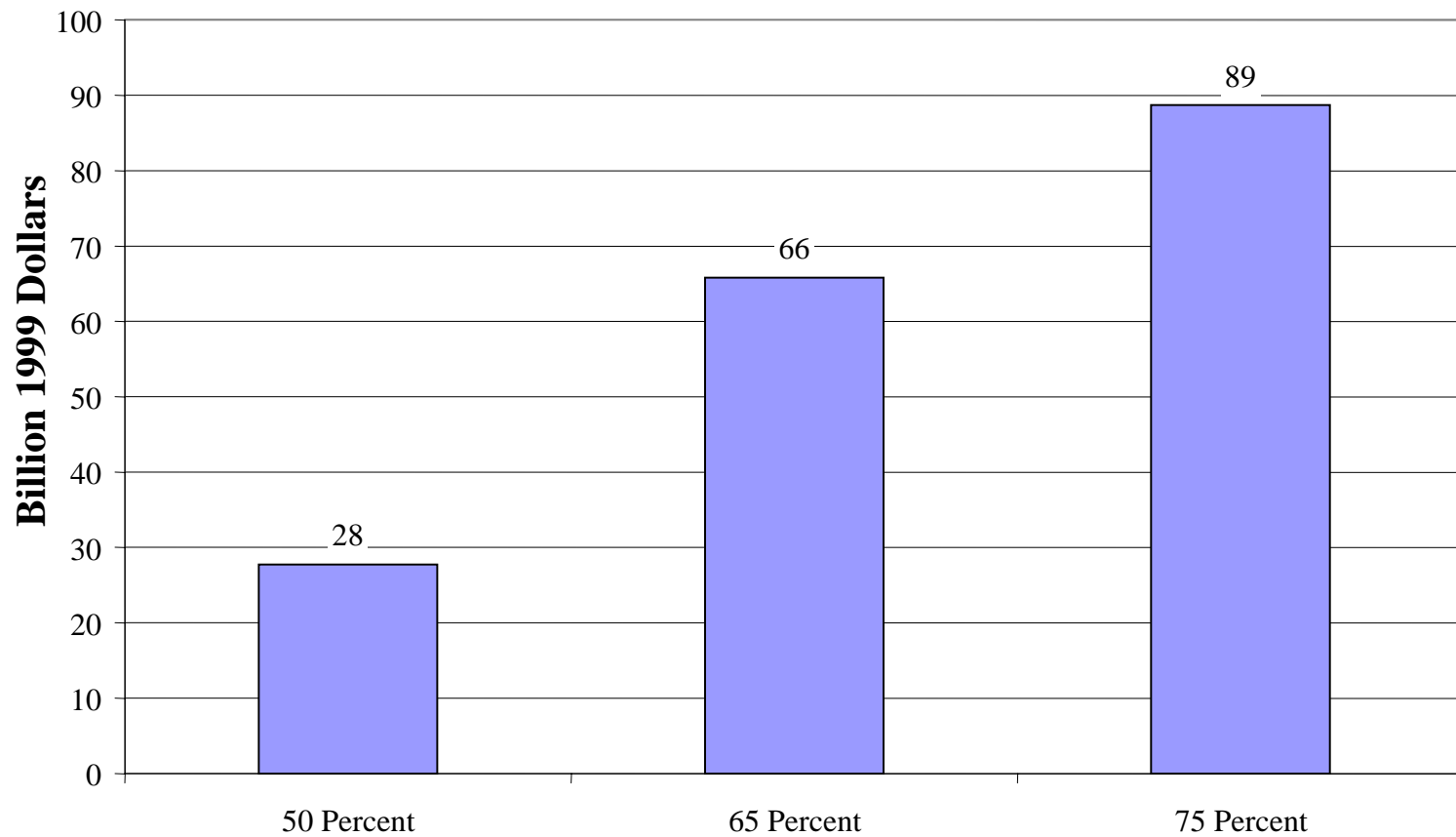
2020 Allowance Prices



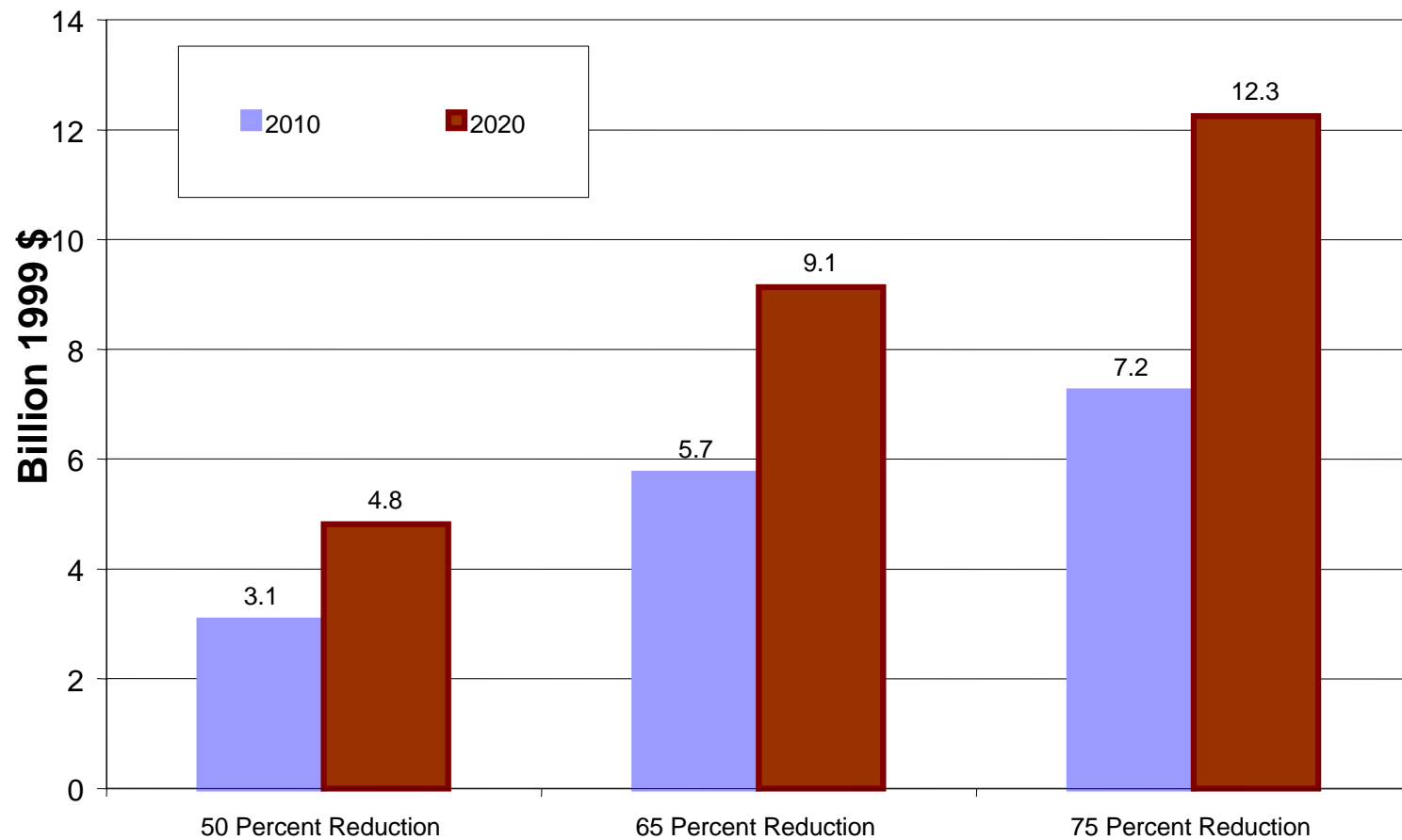
Average Electricity Prices, 2020



Projected Change in Supplier Resource Costs from Reference Case, 2001-2020



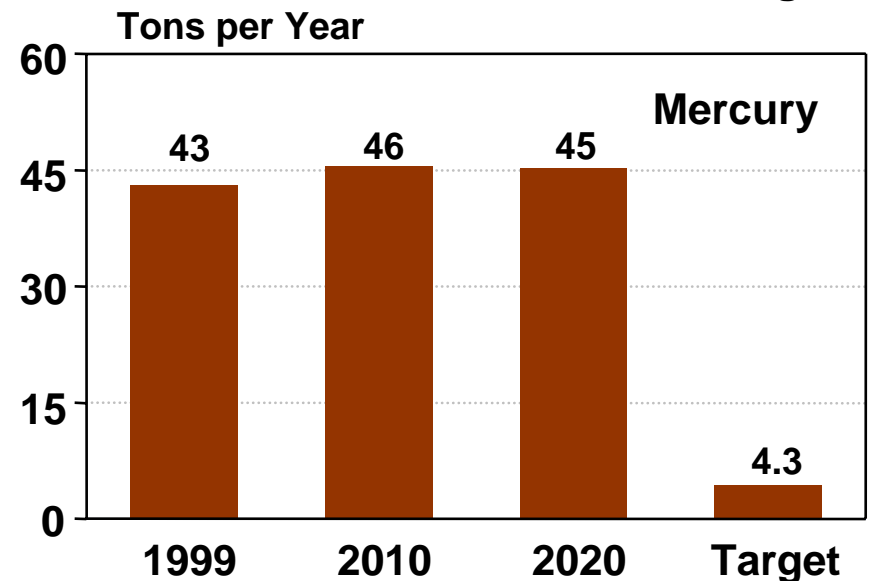
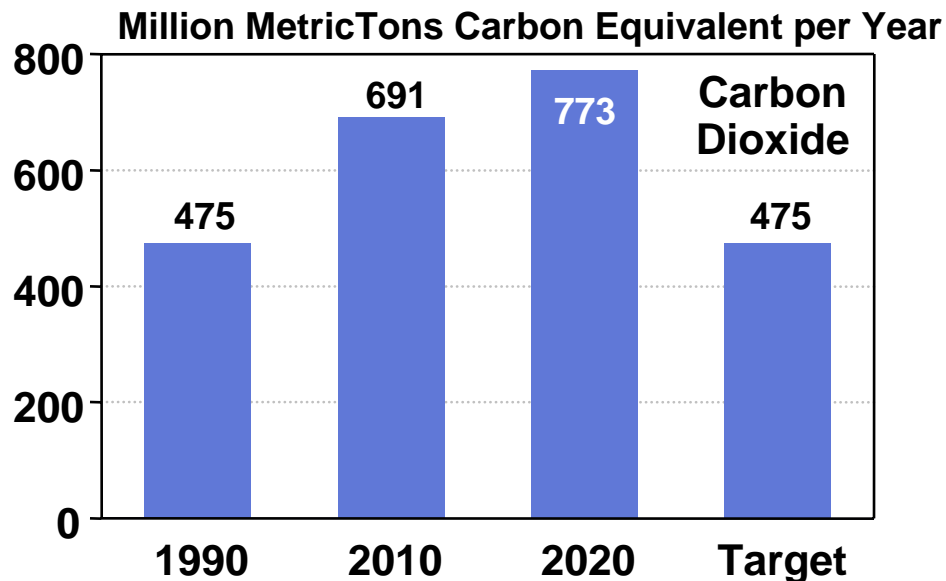
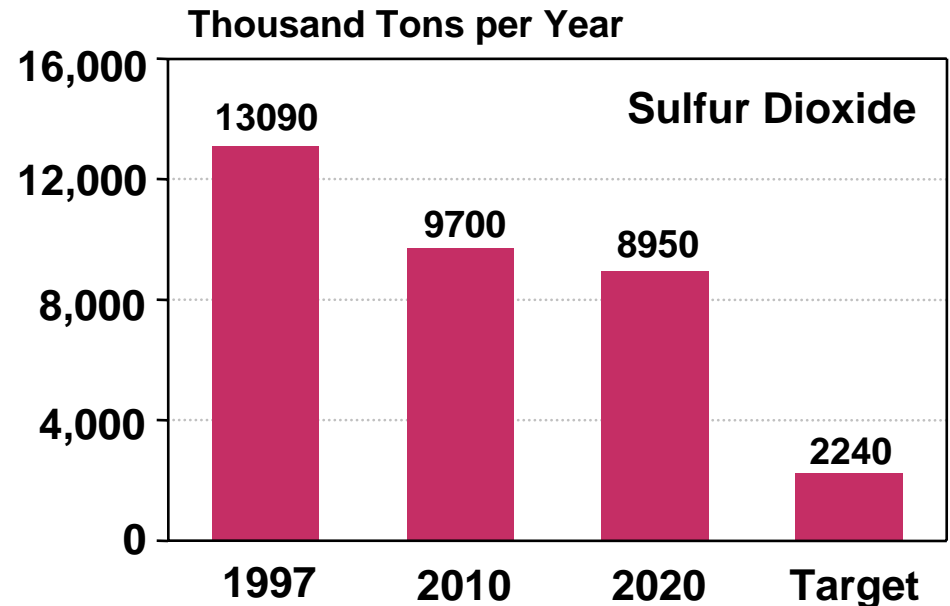
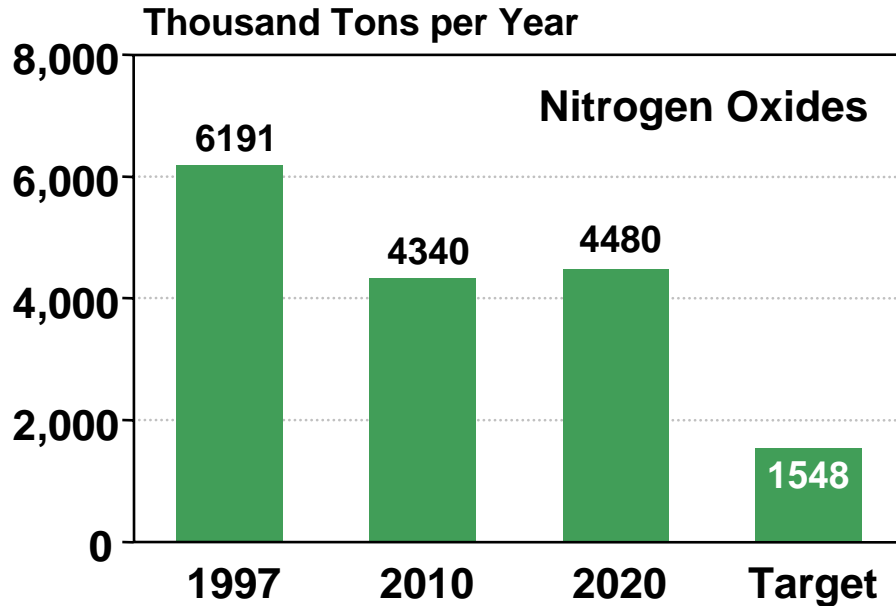
Annual Change in Resource Costs From Reference Case



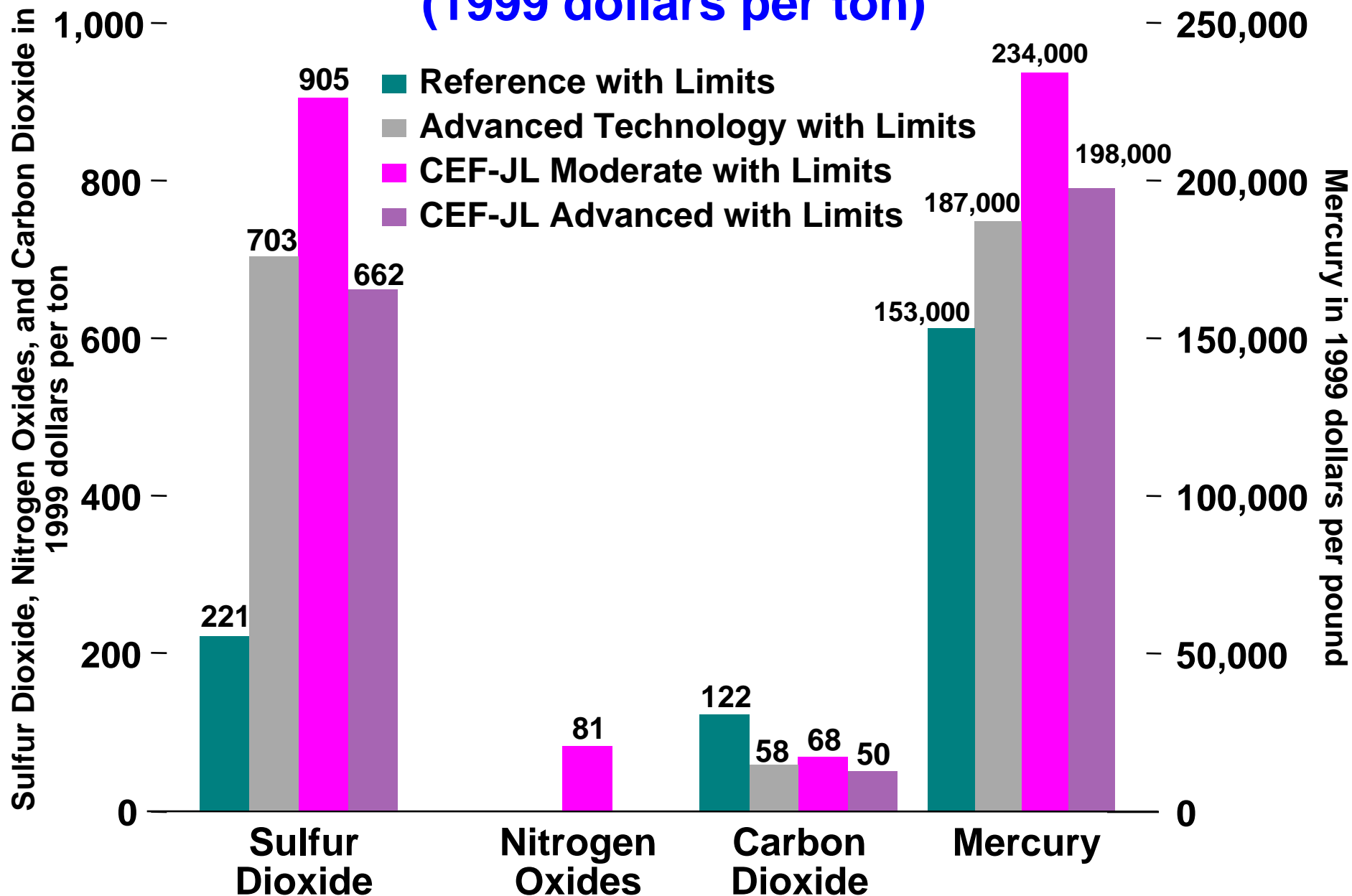
The Jeffords/Lieberman Report

- Assumed Reductions in NO_x, SO₂, CO₂, Hg
- Four Sets of Technology Assumptions: AEO2001 Reference and Advanced Technology Cases, and CEF Moderate and Advanced Technology Cases
- Cases With and Without Emission Controls

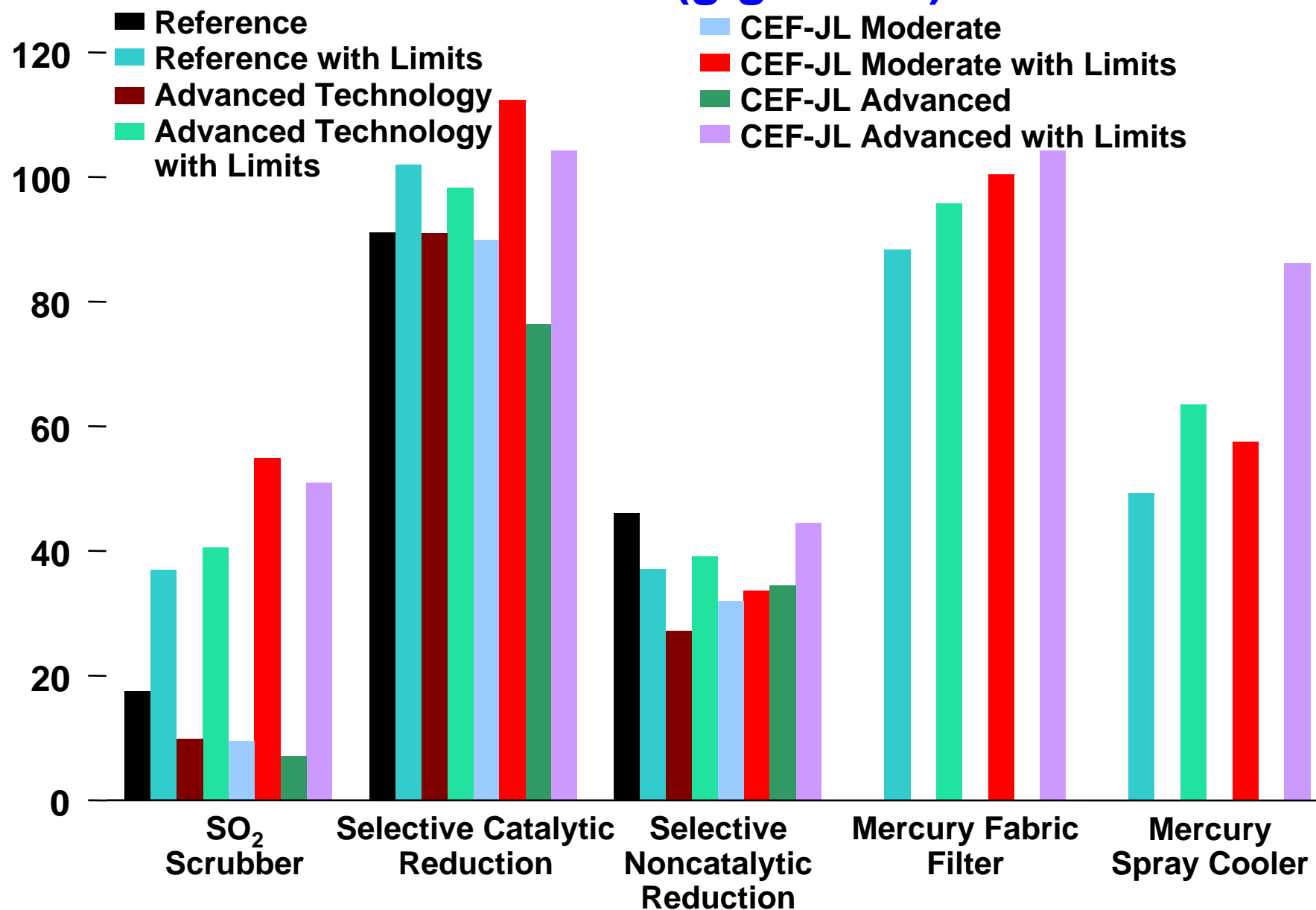
Emission Levels, Reference Case Projections for 2010 and 2020, and Target Caps for Electricity Generators



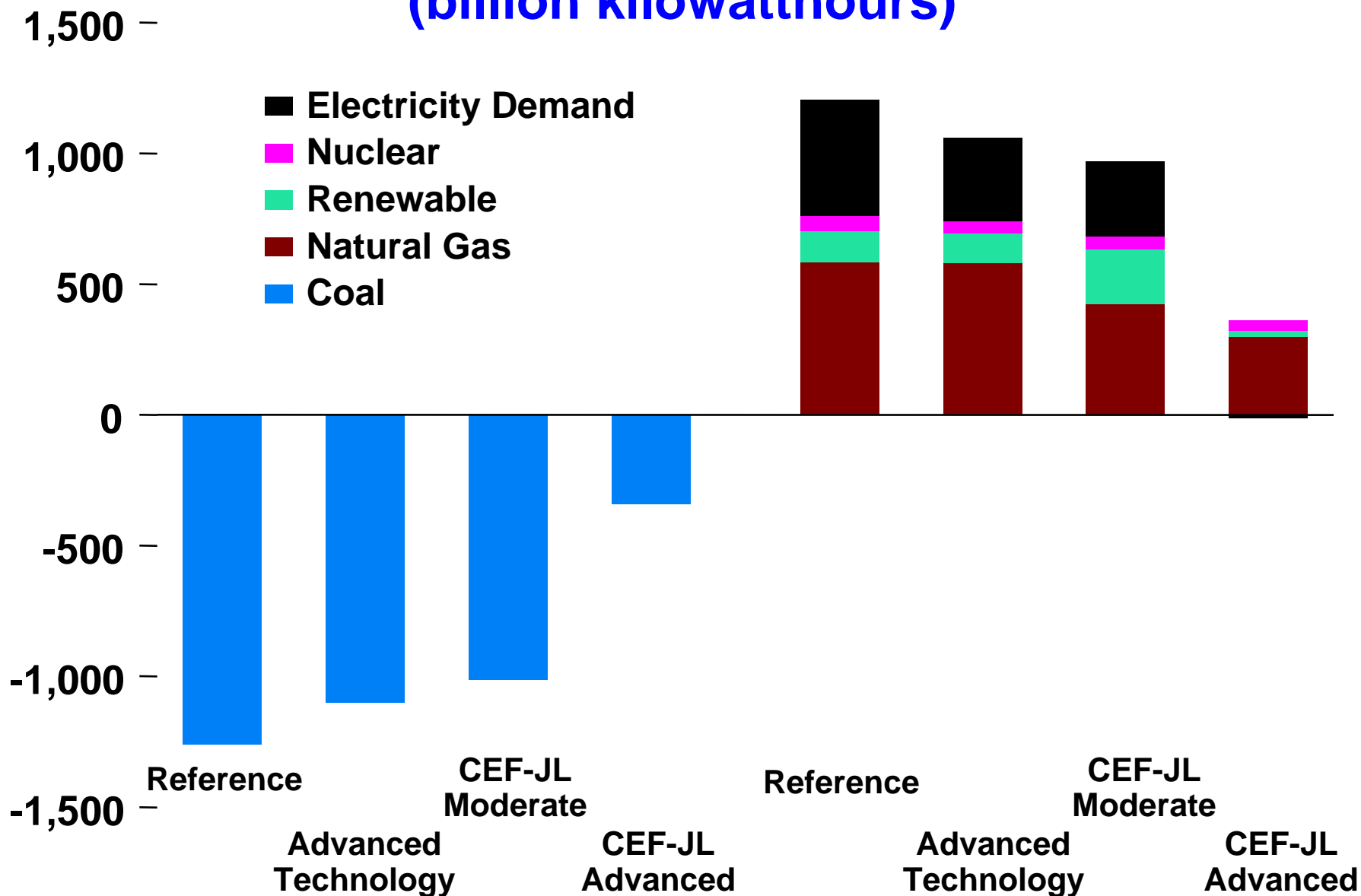
Emission Allowance Prices in Four Cases, 2020 (1999 dollars per ton)



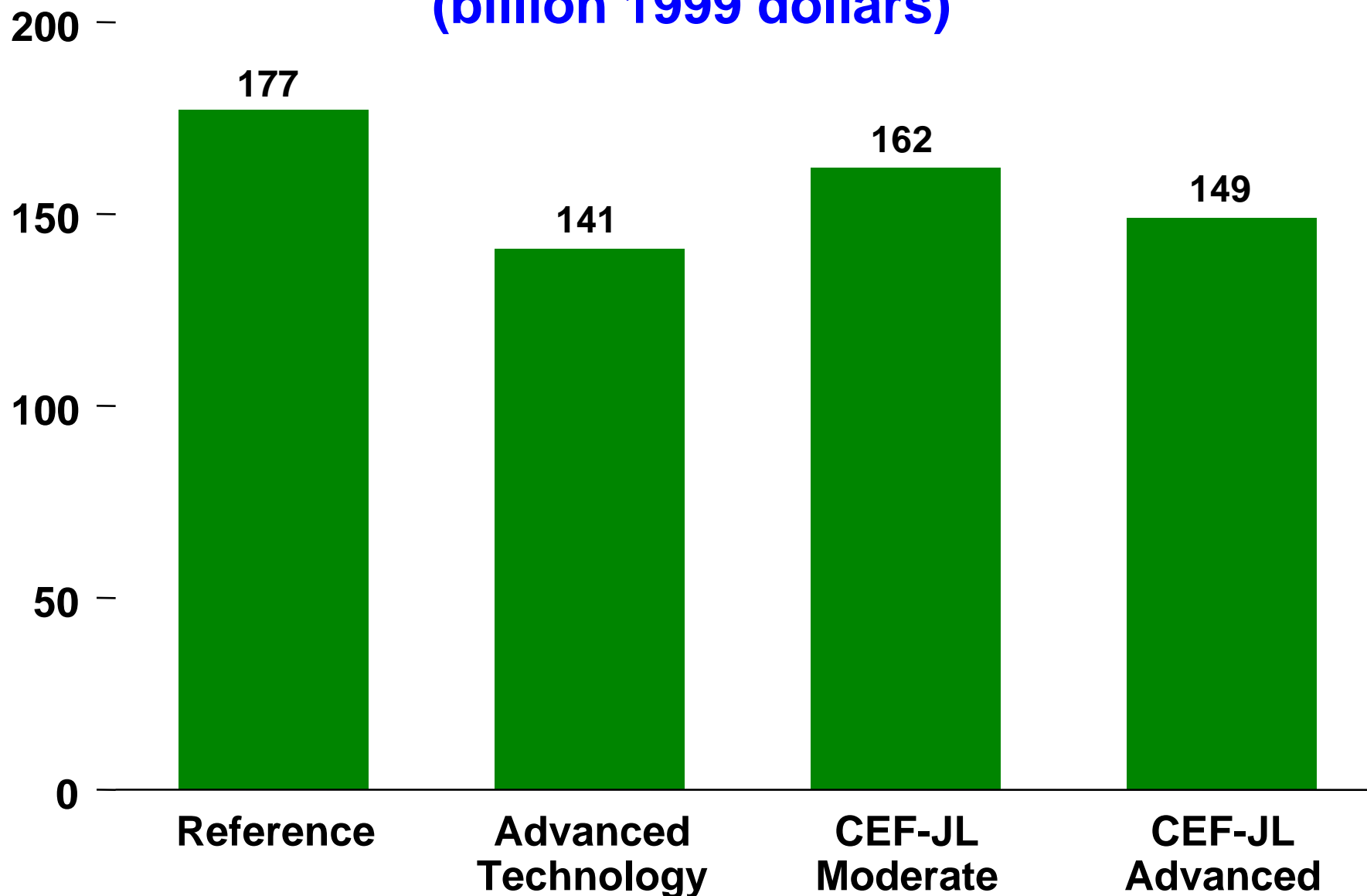
Projected Additions of Emissions Control Equipment, 1999-2020 (gigawatts)



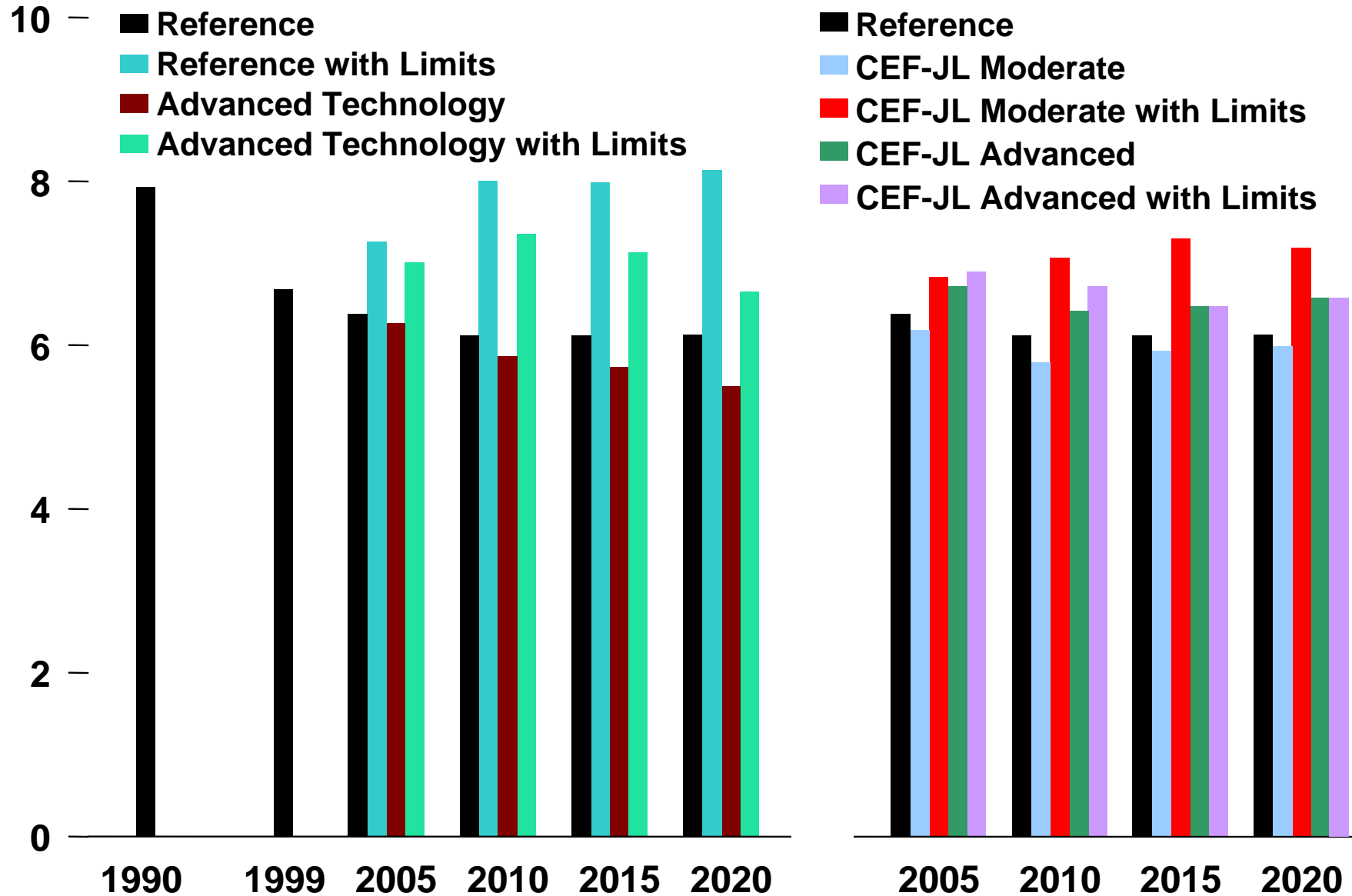
Change in Coal vs. Natural Gas, Renewable, and Nuclear Generation and Electricity Demand in Four Cases, 2020 (billion kilowatthours)



Impacts of Emission Limits on Cumulative Resource Costs for Electricity Generators, 2001-2020 (billion 1999 dollars)



Electricity Prices, 1990-2020 (1999 cents per kilowatthour)



Summary

- Addition of emission reduction equipment is the main response to SO₂, NO_x, and Hg emission reductions
- Reductions in CO₂ require switching from coal to natural gas, and reduced electricity demand
- Average electricity prices rise as much as 33 percent in 2020 under a 4-pollutant strategy, and about 6 percent under a 3-pollutant strategy
- Cumulative incremental resource costs for electricity production range from \$141 to \$177 billion under a 4-pollutant strategy, and from \$28 to \$89 billion under a 3-pollutant strategy
- Advanced technology reduces the direct cost of emissions control, but consumers and producers could incur costs of more efficient equipment

Uncertainties

- Measurement and control of mercury emissions
 - Understanding of factors driving mercury emissions is improving but many unknowns remain
 - Technologies for mercury removal from coal plants relatively new compared to SO₂ and NO_x controls
- Ability of lower carbon fuels to replace coal generation